CONSERVATION FARMING FOR THE SANDY LANDS OF THE SOUTHERN GREAT PLAINS

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

THIS IS ONE of a series of three publications that deal separately with the different conditions and problems that must be met in effecting soil and water conservation on three distinctive kinds of land in those parts of Kansas, Colorado, Oklahoma, Texas, and New Mexico included in the southern Great Plains. It furnishes practical guidance in soil- and water-conserving methods for farmers of the sandy lands. Similar publications are being printed for farmers of the hard lands and the range lands of the southern Great Plains.

The text sets forth briefly (1) the necessity for adapting soil- and water-conservation practices to the land; (2) a designation of the broad classes of land that may respond to similar conservation treatments and a description of the sandy croplands dealt with in this bulletin; (3) the need for a careful selection and a close coordination of conservation practices to fit each situation; and (4) a discussion of conservation farming methods recommended by the Soil Conservation Service for use on the sandy croplands of this region.

Soil- and water-conservation practices have been adopted widely throughout the southern Great Plains during recent years. Much information is available about the installation of the conservation practices most commonly used; however, the need for further information on planning for a complete, coordinated conservation-farming program has become apparent as the conservation movement spreads. This publication has been prepared primarily for those farmers who are already familiar with commonly used conservation practices but need more information about the selection and coordination of the practices that will fit best their particular type of land and farming system.

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Conservation Farming for the Sandy Lands of the Southern Great Plains

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INTRODUCTION

Farming With the Climate

In a country of sparse and erratic rainfall, where high, erosive winds prevail during critical periods and the weather is never predictable from one season to the next, residents of the Plains have come to recognize that the climate is not dependable and that farming at its best is a hazardous enterprise.

The hazards of farming may be lessened materially, however, by the application of a plan of conservation farming that is adapted to the climate. The erratic character of the rainfall, the variations in length of growing seasons, and other irregularities of the climate should be given full consideration in planning farm operations. Likewise, the virtual certainty of high winds in the spring and the probability of hot winds in the summer must influence farming plans. The Plains farmer has one distinct advantage, though, in dealing with the climate; he finds it very similar over large areas, and once he has learned to farm with the climate he may use similar methods with success on any lands of the same type.

Farming to Suit the Land

Conservation practices must fit the climate, but just as important, they should be varied to fit the land, and the land should be used for

purposes to which it is adapted. These are fundamental principles which should not be ignored in planning a system of conservation farming for any region. They are as essential on the Plains as elsewhere.

The land of the region, like the climate, is variable. Broad stretches of almost level land are common on the Plains; but undulating, rolling, and steep, broken lands also may be found in most sections. Silt and clay loams, loams, sandy loams, loose sands, and tight clays may be found interspersed throughout the region. Deep soils and shallow soils often lie side by side. Some fields have been seriously damaged by erosion, while neighboring land of the same type has as yet suffered but little in this respect. Some of these differences in the land are hardly discernible to the inexperienced, but, nevertheless, may be highly important to the practical farmer and call for equal variations in farming practices.

A successful program of conservation for any given farm must fit the land of that farm. It probably will be necessary even to vary the program for different fields on the same farm. The slope of the land, the water-absorbing and water-holding capacity of the soil, and the expected use of a field should be determining factors in planning a water-conservation program. The depth of the soil, its texture and structure, and the character of the subsoil should govern its use and influence the system of crop management. The kind of land on the farm will determine largely the type of farming most practical. These are but a few examples of the way physical land conditions must influence the farming program.

Three Broad Classes of Land

The lands of the southern Great Plains may be divided into three broad classes for the purpose of discussing adapted conservation treatments, provided that irrigated tracts, the alluvial lands along stream beds, and waste lands are excluded. These broad classes are (1) the hard or tight lands with soil deep enough for profitable cultivation; (2) the sandy and mixed lands that are suitable for cultivation (hereafter referred to as the sandy croplands); and (3) the lands adapted only for range purposes (shallow, tight soils; loose, sandy lands; very tight clays; rough, broken lands; and others).

In making definite recommendations on conservation practices, each of these three broad classes of land should be divided into several groups according to the variations in physical land conditions, climate, and adapted crops.[1] Since, however, the conservation treatments that should be applied to most kinds of land within each class will be similar in many respects, it seems feasible to discuss methods common

[1] U. S. Soil Conservation Service. Problem-area groups of land in the southern great plains, 40 pp. February 1939.

to the sandy and mixed croplands as a whole, with more specific recommendations for various groups of land within the class.

THE SANDY CROPLANDS

The sandy croplands as referred to in this publication include practically all the land of the region of gentle to moderate slope that has a sandy loam or loamy sand surface soil and a subsoil of a character that permits profitable cultivation.

Based on physical characteristics, the sandy croplands may be roughly divided into two groups: (1) The sandy soils, commonly known as sandy row-crop lands; and (2) the moderately sandy soils, often referred to as moderately sandy, diversified croplands and sometimes designated as mixed lands. In this publication hereafter these two groups of the sandy croplands will be referred to as the sandy soils and the moderately sandy soils.

Loose sandy soils and sand-hill areas are not considered as croplands and are not discussed in this publication. Some of the loose sands in this region are cultivated at present. They are not suitable for cultivation because of their very loose structure and susceptibility to wind erosion; hence, caution should be used in distinguishing between the sandy croplands and the loose sandy soils.[2]

Many variations in soil texture, structure, and depth may be found within each of the two groups of sandy croplands, but the lands in each group have similar capabilities and generally may be discussed together. It is recognized that often it may be difficult to determine whether the land of a given field should be classed as sandy soil or moderately sandy soil. In some cases a detailed survey of the land may be necessary to distinguish between the two. Such surveys are recommended as a preliminary step to making detailed plans for a long-time conservation farming program on any farm.

Soils

Surface soils of the sandy croplands vary from loamy sands to very fine sandy loams. The fine sandy loams, sandy loams, and loamy fine sands predominate. Most of the sandy soils are composed of single grains, while the structure of the moderately sandy soils is crumb to single grain. Surface soils are normally deep, but may be comparatively shallow where severe erosion has occurred.

The subsoils range from sandy loam in texture to sandy clay. Deep, sandy clay loam subsoils are most common. The subsoils are characterized by their tendency to break into large prismatic columns when dry.

[2] The distinction between the loose sandy soils and sandy croplands is explained in U. S. Dept. Agr. Unnum. Pub., Conservation Practices for Range Lands of the Southern Great Plains.

The rate of water absorption is rapid on the sandy soils but may be less rapid on the moderately sandy soils. The moisture-holding capacity of the sandier soils is relatively low but increases normally as the soils become finer in texture. The rate of run-off is slow, but there may be a moderate amount of surface water movement during heavy rains, especially on the steeper slopes and where heavy subsoils are near the surface.

Under virgin conditions the topsoils of the moderately sandy soils contain an adequate amount of organic matter and, in general, these lands are among the most highly productive of the region when not abused. They are used principally for the production of row crops, but wheat is grown successfully in some localities. Small areas found in association with hard lands are frequently used for wheat production.

The sandy soils have less organic matter as a rule and normally are not as productive as the moderately sandy soils. The organic-matter content, the fertility, and the productivity of these lands may be decreased greatly by severe wind or water erosion. A wide variety of adapted crops may be grown on these sandy soils, but they are suited best to the production of summer crops because usually they are not capable of storing enough soil moisture to support plants through the normally dry winter months; hence, they are commonly designated as sandy row-crop lands.

Physiography

The sandy croplands range in slope from almost level to gently rolling and undulating. The moderately sandy soils are found for the most part on flat, almost level areas of the High Plains, where drainage often is into intermittent lakes or playas. Small patches of these soils occur, however, on the rolling Plains, where they drain into streams. The slope normally ranges from 2 to 4 percent.

The topography of the sandy soils in many instances has been modified by wind action; hence, they frequently are undulating to gently rolling in character. Slopes usually range from 2 to 5 percent and the drainage is normally into streams.

Location and Extent

The sandy croplands may be found in large and small areas scattered throughout the southern Great Plains. They are commonly found in relatively large blocks on the High Plains, with smaller but frequent patches in the rolling Plains of the southeastern part of the region. Often the sandier soils of this class are found in the vicinity of streams.

The map of the region discussed in this publication, which appears on inside back cover, depicts the general location and extent of the sandy croplands. It distinguishes between the sandy soils and the moderately sandy soils. It further divides each of these two groups

into four problem-area groups (indicated by different kinds of hachure) according to crop adaptations.[3] Uncolored portions of the map represent areas with other kinds of land.

The areas depicted on the map are as accurate as existing information and the scale of mapping permit. Within the boundaries of most areas outlined are tracts of land too small to map that are of a different type. A further refinement of the map, however, must depend on detailed surveys of the region. It is intended that the recommendations of this publication be applied only to the lands described as

KANS-1041

FIGURE 1.—Abandoned farm in the southern Great Plains. The surrounding area was productive sandy cropland until drought and crop failures led to severe wind erosion and abandonment. The humus and finer soil particles were carried away by the wind and the coarser sand particles blown onto the farmstead and adjacent pasture. The entire area rapidly became a series of sand dunes.

sandy croplands and not strictly to the areas shown as such on the map.

Within the group classed as sandy soils may be found approximately 12,000,000 acres in this region, while the moderately sandy soils cover slightly less than 4,000,000 acres.

LAND USE

A relatively high percentage of the sandy croplands has been placed in cultivation, often without proper precautionary measures being

[3] In addition to its distinctive hachure each subgroup is further identified by number and letter.

taken against soil erosion. The moderately sandy soils, being highly productive, almost invariably are found in cultivation. Many small patches and a few larger areas of the sandy soils yet retain their virgin cover.

Erosion

Severe wind erosion has damaged much of the sandy cropland of this region. The sandier soils are highly susceptible to wind erosion, and the moderately sandy soils become very susceptible once erosion has progressed to the stage where the organic matter of the topsoil has been depleted. Some of the most severe wind erosion of the region has occurred on the sandy soils (fig. 1).

Wind erosion spreads rapidly on such lands. Crop failure occurring on scattered fields of a large area may start erosion hazards that quickly spread over the entire area. Erosion, starting on cultivated or abandoned fields, often spreads to adjacent pasture lands. In several instances where the land has been neglected, sandy soils within recent years have been changed from almost flat, level cropland to sand-dune areas.[4]

Erosion by water is not a serious problem on the more level lands of this class, but may become severe on the steeper lands, especially along the eastern side of the region in the rolling Plains and in places where a heavy subsoil is near the surface.

CONSERVATION FARMING

Many Kinds of Conservation Practices

Crop failures and duststorms on the southern Great Plains will not be eliminated by any cure-all or panacea. The problems of the Plains are complicated and the treatment must be complex. Many kinds of soil- and water-conservation practices are available to Plains farmers, and on most tracts of land it is necessary to use numerous and varied methods to attain the desired end. Cover crops, terraces, contour tillage, strip cropping, border strips, rough tillage, contour furrows, controlled grazing, tree planting, and revegetation are but a few of the most commonly used practices adapted to various types of land of the region. The exclusive use of a single practice, however, cannot be expected to solve the numerous problems involved in crop failures and soil erosion—any more than a single medicine can be expected to cure a great variety of human ailments.

The best soil- and water-conservation program will make use of all practices that are adapted to the land. The selection of practices to serve best the desired purpose may require careful judgment in

[4] Whitfield, Charles J., and Perrin, John A. sand-dune reclamation in the southern great plains. Farmers' Bul. 1825, 13 pp., illus. 1939.

many cases; hence, a thorough study of the land of the farm and the farming system should precede the installation of the program.

Coordination of Practices

The selection of the proper conservation practices to fit the land and the climate is important, but of equal importance is the coordination of the practices used so that they will blend into a unified program of conservation farming. Each practice used on a tract of land should be so planned and carried out that it will best support the other conservation methods in use.

Crop rotation is recognized as a good farming practice, but when combined with strip cropping, a strip rotation results, which gives the desired diversification and change of crops on the field and also aids materially in stopping soil erosion. Strip cropping may reduce erosion hazards, but it is most effective when on the contour and supported by terraces. Water conservation by terracing and contour tillage produces the desired results only when used with a good system of crop management. Emergency tillage sometimes may be necessary to control soil blowing, but it will be found most effective where crop residues have been incorporated in the soil and rainfall has been conserved. Cover crops will control erosion, but usually they are not profitable except where the farm supports a livestock enterprise, and in many places they cannot be grown at the proper time unless all water that falls on the land is conserved. In a similar fashion it will be found that almost any conservation measure advocated will depend for its most successful use on its coordination with one or more other practices.

Economic Factors

Assuming that all adapted types of soil- and water-conservation practices are used and that such practices are coordinated properly with each other, the conservation program yet may fail if economic factors are ignored. It is not enough to consider only the climate and the land. The farm operator also must be considered. True conservation should not be hoarding. It profits the farmer but little to save his soil with cover crops and then be unable to market the produce of the crop. Efficient use of the soil and water conserved often becomes as important as the conservation of these resources.

In some instances it may be necessary within the limits of safe land use to modify the ideal conservation program in order for the farm to produce income enough to support its operator. The most serious erosion on the plains has usually been on abandoned farms (fig. 1). Farm organization and management that will assure an income sufficient to support the farm operator on the land must be considered an essential part of the conservation-farming plan.

Changes in Land Use

It may be necessary on some sandy-land farms to make changes in land use that will require a distinct change in the type of farming. Each tract of land should be used for cash crops, feed crops, pasture, or other purposes in such arrangement and sequence as will provide sound use, according to its capabilities. The farm operator who attempts to use unsuitable, eroding land solely for the production of

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Figure 2.—Abandoned moderately sandy land which wind erosion had kept bare of all vegetation for several years was planted to sorghum and left undisturbed. Weed growth now covers the land, but grasses should enventually take over the area.

erosion-permitting crops is inviting crop failure and eventual destruction of his land.

Severely eroded sandy croplands should be retired from cultivation. Once wind erosion has progressed to the stage where most of the topsoil has been blown away, or where practically all the organic matter has been removed, it usually will be found unprofitable to continue a field in cultivation. In some instances, however, deep, sandy lands that were severely eroded have been reclaimed profitably for crop production by stabilizing the land with sorghum cover crops.

LAND RETIREMENT

The first step in returning cultivated land to grass is to stop soil blowing. Stabilization of such eroding land can be accomplished

sometimes by contour listing or chiseling and allowing weed growth to cover the land. Weed growth is normally the first step in nature's process of reestablishing grass. As the soil becomes firmer, plant residues more abundant, and soil fertility is rebuilt, desirable grasses gradually creep in among the weeds and eventually the entire area may be covered with suitable grazing plants.

It is often necessary to plant wind-erosion-resistant crops, such as Sudan grass, broomcorn, Sorgo, or grain sorghums, in order to stabilize sandy croplands that have blown badly, especially on very sandy

TEX-1297

FIGURE 3.—Planting native grass seed on retired land that has a good cover of stubble and other crop residues.

soils. It is advisable to leave all stalks and stubble on the land for protection against blowing while weeds are becoming established (fig. 2).

The natural processes of revegetation are very slow, many years being required for the land to become covered with high-quality grazing plants, but this process may be hastened by planting adapted grasses during favorable seasons on land having an abundance of crop residues or other types of nongrowing cover (fig. 3).

Native grasses, including sand bluestem, side-oats grama, blue grama, and sand dropseed, are best adapted for revegetation of sandy lands. They should be planted during the spring, preferably April.

Sorghum cover crops, on land to be planted to grass, should be

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close drilled, with rows 12 to 20 inches apart. The cover crop should be mowed high before it produces seed and all of the crop residue left on the ground. It is very difficult to establish a stand of grass by seeding on land covered with growing weeds or volunteer crops which compete with the small grass plants for moisture. If weeds come up thickly, after the grass is planted, they should be mowed.

PASTURE TO CULTIVATION

Many small tracts and a few larger areas of the sandy croplands, suitable for cultivation, retain their virgin cover and are used for pasture. In most instances, however, these tracts of grazing land are found in small patches on farms where pasture land is inadequate at the present time; hence, it is seldom advisable to place them in cultivation. If such land is placed in cultivation, a complete, coordinated program of conservation farming should be instituted at the time it is plowed up in order that it may retain its virgin productivity.

Crop Management

A well-planned cropping system should provide for the maximum farm income that is consistent with good conservation practices. A system of crop management that keeps adequate cover on the land during most of the year is highly important in the conservation program because vegetative cover is the only safe preventive of soil erosion. It is also necessary that crops be grown that can be marketed, either as cash crops or through livestock. The best cropping plans will not be developed without careful thought, and such plans must always be subject to change on short notice because drought, hail, markets, insect pests, and many other factors may upset the plan.

DIVERSIFICATION

Most of the sandy croplands of this region are adapted to growing a variety of crops. There is little reason why a one-crop farming system should be used on a farm that is made up predominantly of land of this class.

Diversification of crops is fundamental in a good farming program. It is the best insurance against complete crop failure for any one year. It usually will afford the feed crops necessary for a balanced system of farming, and it may be considered a good erosion-control practice because diversification usually leaves at least a part of the land covered with a growing crop or crop residues at all times (fig. 4).

CROP ROTATION

Due to extreme fluctuations in climate over most of the region, including irregularity of rainfall, a fixed rotation of crops is seldom practical. A flexible rotation is highly desirable, however, especially

in areas where there is a wide variety of adapted crops. The cropping system and the system of rotation should be flexible and so planned that always there will be a substitute crop available for land on which crop failure occurs.

The sandy croplands on the rolling Plains in the southeastern part of the region are better adapted for a systematic crop rotation than the lands in other parts of the region because of higher rainfall and less variation from year to year.

COVER CROPS

It is highly essential that most of the sandy croplands, especially those that are subject to wind erosion, be protected with a cover of

TEX-17740

FIGURE 4.—Diversification may provide for both cash crops and feed crops. The moderately sandy soil shown above produces cotton and grain sorghums with equal success.

stubble, crop residues, or growing crops during the winter and spring months. The sandy soils may be expected to erode severely if left bare during this critical blow season and cover may be just as essential on the moderately sandy soils if seriously eroded. Dense-growing sorghum stubble that is from 10 to 16 inches in height makes a very effective winter cover for blow lands (fig. 5). Stubble of this kind not only checks erosion, but helps to hold drifting snow on the land where it falls. Stalks and stubble that are needed for winter and spring cover should not be grazed.

TEX-958

FIGURE 5.—Dense-growing sorghum stubble at least 10 inches high makes a good cover for blowing land during the winter and spring.

TEX-2683

FIGURE 6.—Sudan grass and other adapted sorghums are generally the most dependable wind-erosion-resistant crops for the southern Great Plains.

On sandy lands that have blown for several years it may be necessary to plant sorghum cover crops continuously for a period of years and return most of the residues to the soil before erosion can be checked to the extent that normal farming practices can be resumed. The ability of adapted varieties of sorghums to withstand drought and hold blowing soil in place makes them invaluable as cover crops

TEX-17834

FIGURE 7.—Contour strip cropping on sandy soil of the southern High Plains with cotton and Sudan grass. Narrow strips are found to be best on lands that are very susceptible to blowing. Note that a high stubble was left on the Sudan strips to protect the land during the winter and spring blow season.

(fig. 6). Dense-growing crops, stubble, or other residues that cover the ground also are the best check against water erosion.

STRIP CROPPING

Strip cropping, when properly applied, may be considered an effective erosion-control practice for sandy croplands that have not suffered severe erosion. Where erosion has progressed to an advanced stage and most of the organic matter has been blown away, strip cropping is not recommended. Solid plantings of erosion-resistant sorghums or retirement to permanent vegetation seem to be the only feasible treatment for such lands (figs. 2 and 6).

Grain sorghums, Sorgo, Sudan grass, broomcorn, or other similar crops should make up the erosion-resistant strip in any strip-crop pattern for wind-erosion control. On the sandy soils strips should be

narrow and the erosion-resistant strips should be of equal or greater width than the strips of erosion-permitting crops (fig. 7). On the moderately sandy soils the erosion-resistant strips normally should cover about one-third of the field (fig. 8). Strip cropping always should be on the contour in order that it may serve as a water-conservation measure. In addition to acting as an erosion-control device, strip cropping necessitates a certain amount of diversification, and it fits well into a system of crop rotation.

BORDER STRIPS

Where sandy croplands lie adjacent to other fields that are blowing, or to dirt roads, it may be advisable to plant field borders of sorghum

TEX-17602

FIGURE 8.—Contour strip cropping on moderately sandy soil of the southern High Plains with cotton and Sudan grass. For these soils an erosion-resistant strip that covers approximately one-third of the field is found effective.

cover crops. The stalks and residues of such border strips should be left on the ground until the next crop is planted. Strips of this type often may prevent the spreading of wind erosion from adjacent lands to large areas of a field. Border strips should have a minimum width of 25 to 30 feet and should be increased in width according to the severity of the adjacent blow hazards.

The use of border strips is usually not advisable, however, where adjoining fields are blowing severely and continuously. Silt and sand deposits from adjacent land that is blowing badly, will soon cover

border strip areas and often form hummocks that in turn will begin to blow. The control of the adjacent blow hazards seems to be the only safe practice in such cases. Border plantings that are extended to include nearby blowing lands and roads may solve the problem of adjacent blow hazards.

CROPPING ADJUSTMENTS

Owing to the wide range in climate over the region, the adapted crops for different sections vary considerably; hence, in the subsequent discussion of adjustments in crops and cropping systems for a conservation program, the sandy croplands are divided into eight problem-area groups as follows:[5] (1) Sandy soils of the northern part of the region (problem-area group No. 5a), where corn, beans, and sorghums are the principal crops; (2) sandy soils of the central part of the region (problem-area group No. 5b), where the sorghums are the principal adapted crops; (3) sandy soils of the southern High Plains (problem-area group No. 5c), where cotton and sorghums are the principal crops; (4) sandy soils of the rolling Plains in the southeastern part of the region (problem-area group No. 5d), where cotton and sorghums are the principal crops; (5) moderately sandy soils of the northern part of the region (problem-area group No. 3a), where corn, barley, wheat, and sorghums are adapted crops; (6) moderately sandy soils of the central part of the region (problem-area group No. 3b), where sorghums and wheat are the principal crops; (7) moderately sandy soils of the southern High Plains (problem-area group No. 3c), where cotton, sorghums, and wheat are adapted crops; and (8) moderately sandy soils of the rolling Plains in the southeastern part of the region (problem-area group No. 3d), where cotton and sorghums are the principal crops. (See map, inside back cover.)

Cropping recommendations for sandy soils of the northern part of the region.—Corn and beans have been the principal crops grown in the past and severe erosion has resulted on much of this land and has made it necessary to retire large areas to grass. Corn should be replaced largely by early-maturing varieties of sorghums. On fields where erosion has not been too severe stabilization may be accomplished by growing sorghums or other erosion-resistant crops. Where wind erosion has been completely checked, some corn and beans may be grown in a contour strip-crop pattern with dense-growing sorghums. The strips should be very narrow and the strips of sorghum should be at least as wide or wider than the strips of corn or beans.

Cropping recommendations for sandy soils of the central part of the region.—Sorghums are well adapted to these lands and are the safest

[5] Problem-area groups, Nos. 3a, 3b, 3c, 3d, 5a, 5b, 5c, and 5d, referred to in this publication and shown on the map, are groupings of the land of the region made by the regional office of the Soil Conservation Service, Amarillo, Tex., originally published in Problem-Area Groups of Land in the Southern Great Plains. (See footnote 1.)

crops to grow. Attempts to grow corn and wheat on much of this land in the past have resulted in severe damage by wind erosion. Many fields have been damaged so severely that they should be retired from cultivation to permanent vegetation. Fields that are retained in cultivation should be stabilized by the growing of sorghum crops and the incorporation of stalks and other residues into the soil. Where wind erosion has been completely checked, some corn may be grown in a contour strip-crop pattern with sorghums. The strips of corn should be narrow and the strips of sorghum should be at least as wide as the strips of corn. These lands are not adapted for wheat production.

Cropping recommendations for sandy soils of the southern High Plains.—Cotton is the principal crop and should be grown with sorghums in a contour strip-crop pattern. The cotton and sorghum strips should be rotated from year to year. The maximum width of the cotton strips should be from 15 to 20 rows and, if the land has blown severely in the past, the strips should be much narrower (fig. 7). These cotton strips should be alternated with strips of sorghums of an equal or a greater width. Plantings of close-drilled Sudan grass or other sorghums around field boundaries and turn rows and also in point-row areas are recommended. Winter grains, such as wheat or rye, may be planted as cover crops after cotton has matured, and used for supplemental grazing through the winter months.

Cropping recommendations for sandy soils of the rolling Plains in the southeastern part of the region.—The cultivated sandy soils in this section are devoted principally to cotton and sorghum production. Some corn is grown as a feed crop. Systematic rotations and the use of soil-building crops may be practiced. A proper strip-cropping arrangement of erosion-resistant and erosion-permitting crops in rotation is recommended as a safeguard against wind and water erosion. Conservation of crop residues should be practiced in order to control erosion.

Cropping recommendations for moderately sandy soils of the northern part of the region.—Corn ranks first among the crops, but has been replaced by sorghums to some extent during recent years. Small grains, such as wheat and barley, are of secondary importance. Barley fits into crop rotations with corn or sorghums and is used also as a catch crop after wheat failure. Early-maturing sorghum crops should replace corn to a large extent. Sorghums also are recommended as erosion-resistant crops to be used in a strip-crop pattern with corn in order to control wind and water erosion. If wheat is grown, it is advisable to strip it with contour plantings of sorghum that cover approximately one-third of the field. On fields that are not eroded and where crop residues are adequate, a strip rotation of wheat, fallow,

and sorghums has proved very successful. Rye may be planted after corn as a cover crop and for winter grazing.

Cropping recommendations for moderately sandy soils of the central part of the region.—These lands are adapted to sorghum crops, corn, small grains, and beans, where advanced erosion has not taken place. Corn and beans should be grown in a contour strip-crop pattern with sorghums or other erosion-resistant crops. Wheat may be grown successfully on land that has not suffered severe wind erosion. It is usually advisable, however, to strip wheatfields with contour strips of sorghum that cover approximately one-third of the field. On fields that are not eroded and where crop residues are adequate, a strip rotation of wheat, fallow, and sorghums has proved very successful. Border strips of sorghum should be planted around fields that lie adjacent to blowing lands. Rye may be grown successfully as a cover crop and for winter grazing.

Cropping recommendations for moderately sandy soils of the southern High Plains.—Cotton is the principal cash crop, but some wheat is grown and sorghums are well adapted. Cotton should be grown in a contour strip-crop pattern with sorghums. Either of two patterns of strip cropping may be followed: (1) When the fields are terraced, tillage operations should follow the terrace, and the first year the terraces should be planted to sorghums and the terrace intervals to cotton or wheat; (2) if fields are not terraced, the strip lines should be run on the contour and at least one-third of the area planted in sorghums along the contour lines, the area in the intervals between sorghum strips being planted to cotton or wheat (fig. 8). With either type of strip cropping, the strips of sorghum should be rotated across the field from year to year. Turn rows and point rows should be planted to Sudan grass, sorghums, or permanent grass to prevent soil blowing and washing. Rye may be grown to some extent for a winter cover crop and as a soil-improving crop.

Cropping recommendations for moderately sandy soils of the rolling plains in the southeastern part of the region.—Crop production is more dependable than in other problem-area groups since the rainfall is slightly higher and fluctuates less from year to year. Systematic crop rotations can be followed with more certainty. Legumes and green-manure crops are desirable for maintaining soil fertility. In areas where cottor predominates, a system of contour strip cropping with cotton and sorghums should be used. Two patterns of strip cropping are recommended: (1) When the fields are terraced, tillage operations should follow the terraces, which are planted to sorghums the first year; (2) if a field is not terraced, strip lines should be run on the contour and at least one-third of the area planted to sorghums. With either type of strip cropping, the strips of sorghums should be

rotated across the field from year to year. Turn rows and point rows should be planted to Sudan grass, sorghums, or permanent grass to prevent soil blowing and washing. Cover crops of small grains, such as oats and wheat, may be planted in the fall following a cotton crop and used for supplemental grazing as well as for cover crops. If the wheat shows promise in the early spring of making a profitable crop, it may be left to mature for harvest; otherwise, it should be plowed down and the field bedded for cotton or sorghum. Austrian Winter peas may be grown as a legume crop and used to build the soil.

Soil Management

On bare ground it is necessary to have a large amount of organic matter in the soil, and to have a rough and cloddy surface during the late winter and spring months if soil blowing is to be prevented. Coarse, undecayed organic matter is best maintained by preserving all crop residues. Stalks, straw, and other residues never should be burned off the land, but should be mixed with the surface soil.

Timely Tillage

Implements used in the preparation of land for planting should leave crop residues on the surface or lightly mixed in the topsoil and provide a cloddy and ridged or furrowed surface. Such operations should be performed when moisture is present in the soil to plow depth. Tillage operations always should be on the contour.

Timely tillage practices designed to prevent wind erosion are carried out as part of the regular operations in crop production and soil-moisture conservation. They should not be confused with emergency tillage, which may be resorted to after neglects and abuses have resulted in the development of serious erosion conditions.

Emergency Tillage

The use of emergency tillage methods that clod or roughen the surface may be valuable in temporarily checking wind erosion. Emergency tillage operations are of little value in checking wind erosion unless they are performed when the ground is wet, owing to the fact that the topsoils are usually deep and loose and it is often difficult to get tillage implements deep enough to bring clods to the surface when the soil is dry (fig. 9). Emergency tillage practices have only a temporary value; hence, special care should be taken to keep crop stubbles on the land during blow seasons, also to incorporate residues in the soil and use timely tillage as a means of controlling wind erosion.

Water Conservation

Since the sandy croplands absorb water readily and their water-holding capacity is less, the water-conservation problem is not as

urgent on these lands as on the hard lands of the southern Plains. Water is important, however, in all farming operations in this semiarid region. A large proportion of the annual rainfall comes during spring, summer, and early fall months when crops are growing on most of the sandy lands; hence, the principal object of water conservation is to get moisture into the soil for the crop that is on the land rather than to store water for future crops.

Some run-off occurs on practically all the sandy croplands during heavy rains unless adequate water-conservation measures are used. Run-off should not be permitted where it is possible to prevent it.

FIGURE 9.—Deep listing, when the ground is wet, may check soil blowing temporarily on bare sandy lands.

Water conservation is not an end in itself, however, but is merely a means of making crop production more certain, which, in turn, provides effective cover for the land and is the best insurance against soil blowing.

TERRACING

Level terraces should be used on most of the moderately sandy soils that are in cultivation. Terraces should not, however, be considered as the only means for holding water on the land. They do not give the even distribution of water over a field that can be attained if the terraces are supported by contour tillage (fig. 10).

Fields with moderately sandy soils having slopes so steep or topography so irregular that terracing is impractical should usually be

retired from cultivation. Fields where soils are not of sufficient depth to permit proper terrace construction also should be retired to grass.

The broad-base, row-crop terrace that has a base width of 30 to 35 feet for each foot of height will be found most practical. The average height of these terraces is approximately 18 inches. This terrace was developed to meet the needs of power-farming equipment up to four rows in width.

Terracing, as a general practice, is not recommended for sandy soils. Terraces have been used to advantage, however, on some areas of

TEX-17689

FIGURE 10.—On moderately sandy soils contour tillage supported by terraces holds water on the land where it falls.

moderate slope that have heavy or tight subsoils. Where used, on such lands, terraces should be of the broad-base, row-crop type, and usually should be planted to sorghums or other erosion-resistant crops. Narrow-base terraces that are seeded to permanent vegetation, such as grass, also have been used successfully in some instances.

CONTOUR TILLAGE

All tillage operations should be on the contour except where the topography of the land is so irregular that it becomes impractical. On sandy soils of very undulating character, tillage operations across the slope sometimes may be a satisfactory substitute for contour tillage. On the moderately sandy soils, however, it is highly essential

that tillage operations follow the contour of the land as closely as possible to prevent excessive run-off during heavy rains. Contour tillage should be supported by terraces on the moderately sandy soils.

On terraced fields tillage operations should be parallel to the terraces with point rows half-way between the terraces. Not only will contour tillage give a more even distribution of water than can be obtained by terraces alone, but it will assist in terrace maintenance (fig. 10). It is equally important that harvesting operations, especially if done with heavy implements, be parallel to the terraces. Furrows plowed across terraces, or even ruts caused by pulling farm implements across the ridges, may make low places that will permit run-off during heavy rains to overtop terraces and seriously damage them.

WATER-CONSERVING TILLAGE IMPLEMENTS

The damming lister, hole diggers, and various other special tillage implements have been developed for use as water-conserving devices. The damming lister has proved most effective on moderately sandy soils where tillage operations are on the contour and supported by terraces. The use of hole diggers, subsoilers, and other tillage implements designed to permit a more rapid penetration of water into the subsoil, has proved effective on the moderately sandy soils in many instances. Such tillage practices give best results where farming operations are done on the contour and fields are terraced. Water-conserving tillage implements are usually not advocated for the sandier soils.

FALLOW

Fallow, as a means of storing moisture in the soil, has been very successful on some of the moderately sandy soils. It is not recommended, however, for land that has been blowing, and should be practiced only when the surface soil contains a considerable amount of plant residues. Fallow is not recommended for the sandier soils.

WATER CONSERVATION ON PASTURE LAND

The moderately sandy soils in native grass respond readily to contour furrowing. Both the lister type of contour furrows and small contour ridges have proved very satisfactory on moderate or gentle slopes. Chisel-type contour furrows revegetate readily, but have only temporary value because they soon fill up with silt.

On the sandy soils contour furrows generally have not been satisfactory. In some instances, where the grass cover is poor and where there is little danger of soil blowing in from surrounding areas, contour ridges have given good results. The ridges help to prevent loss of run-off water and offer some protection from the wind to relatively bare ground.

Contour furrows or ridges are not recommended for pastures lying near blowing fields. The ridges and the weed growth that come on them the first year make excellent traps for blowing soils, and hummocks that may lead to serious wind erosion over the pasture often are formed.

Water diversion and spreading from natural waterways or roadside ditches to adjacent hillsides will prove beneficial where there is a suitable location for spreading. Sandy lands with a good grass cover will usually lose very little run-off water, but considerable run-off may occur if the plant cover is depleted. Contour furrows, water

TEX-17739

FIGURE 11.—Sudan grass and other adapted forage plants not only protect the soil but provide supplementary pasture and feed crops that may make dairying or other livestock enterprises profitable.

spreaders, and other types of water-conserving structures should be used only on lands where run-off will occur without such treatment.

PASTURE MANAGEMENT

Careful grazing management is the only practical conservation measure on many areas of sandy pasture lands in the High Plains. Since the surface soil is subject to blowing when left without an adequate cover, it is necessary to leave more vegetation on the ground than is the case on hard land. Usually there is little Buffalo grass on sandy lands but more of the bunchgrasses, which require a greater

amount of residue to maintain productivity and do not afford a dense cover for the ground.

Overgrazing, drought, and silt from adjacent blowing lands have severely damaged many pasture tracts during recent years. Since most of the pastures found on sandy-land farms are small, added precautions are necessary, in most areas, to prevent overgrazing. The use of supplementary pastures, such as Sudan grass and other erosion-resistant forage plants, is recommended (fig. 11). These pastures will supply forage during a part of the growing season and give the native pastures a much-needed rest. It also is essential that adequate feed reserves be stored for winter use and to carry the farm livestock through drought years.

Adjacent blow lands should be controlled to prevent soil blowing onto pastures. Contour furrows and contour ridges and water-spreading structures may increase grass growth on pastures of this type where they are adapted; but such practices cannot be considered a substitute for proper grazing practices. Protection of pastures from overgrazing and proper distribution of grazing are fundamentals in the pasture conservation program.

Farm Management

TYPE OF FARMING

A combination of cash-crop, feed-crop, and livestock farming is desirable on most farms where the lands are predominantly of the sandy-cropland class. A large majority of the farms in this region are organized on this basis; hence, radical changes in the type of farming are not needed in most cases. There is not enough livestock, however, to give a proper balance to the farming system on many farms.

On most of those farms of the region that have been organized around a cash-crop-farming economy, where most of the land is devoted to the production of such crops as cotton, corn, beans, or wheat, there is need for a complete change in the type of farming. A livestock enterprise may be considered a necessity for balanced farming on sandy-land farms.

Grain sorghums, sorgo, broomcorn, Sudan grass, and other sorghums are the best erosion-resistant crops for most of these lands; hence they should make up a large percentage of the crops grown. It ordinarily is not profitable to market sorghum feed crops as cash crops. A type of farming should be instituted that will provide for the marketing of these feed crops through livestock. It is highly essential in this respect that reserve feed supplies be stored as stacked feeds, in trench silos, or otherwise (fig. 12). Feed reserves that will carry the livestock of the farm through an entire year are desirable

so that it will not be necessary to dispose of livestock or buy large quantities of feed during drought years.

By maintaining stored feed reserves and growing supplementary pastures, dairying may be made a profitable enterprise on some farms (fig. 11). Hogs and poultry also may fit well into the farming system, or it may be desirable to market most of the home-grown feeds through transient feeder livestock.

TEX-375

FIGURE 12.—Large trench silos are frequently used on the Plains for storing sorghum feed crops grown on diversified farms. The uncertainty of the climate makes it essential that feed reserves in some form be stored for winter use and drought years.

FARM-UNIT REORGANIZATION

Some of the evils of soil abuse in the southern Great Plains may be attributed to the fact that a great number of farms are too small to provide an adequate income except by continuous cash-crop farming. It is improbable that a sound land use and conservation-farming program can ever be established on such farms until they are increased in size; hence, the problem of increasing the size of the farm may be the first essential step in establishing a permanent, stable agriculture.

Where adjacent grazing lands are available, the addition of such land to the farm unit may be the solution. Revegetation of adjacent abandoned lands and their use as grazing lands may correct some situations, but will usually take many years. In other cases, it may

SOIL CONSERVATION PROBLEM-AREA GROUPS OF THE SANDY CROPLANDS OF THE SOUTHERN GREAT PLAINS

BASED ON PHYSICAL FACTORS

U. S. DEPARTMENT OF AGRICULTURE

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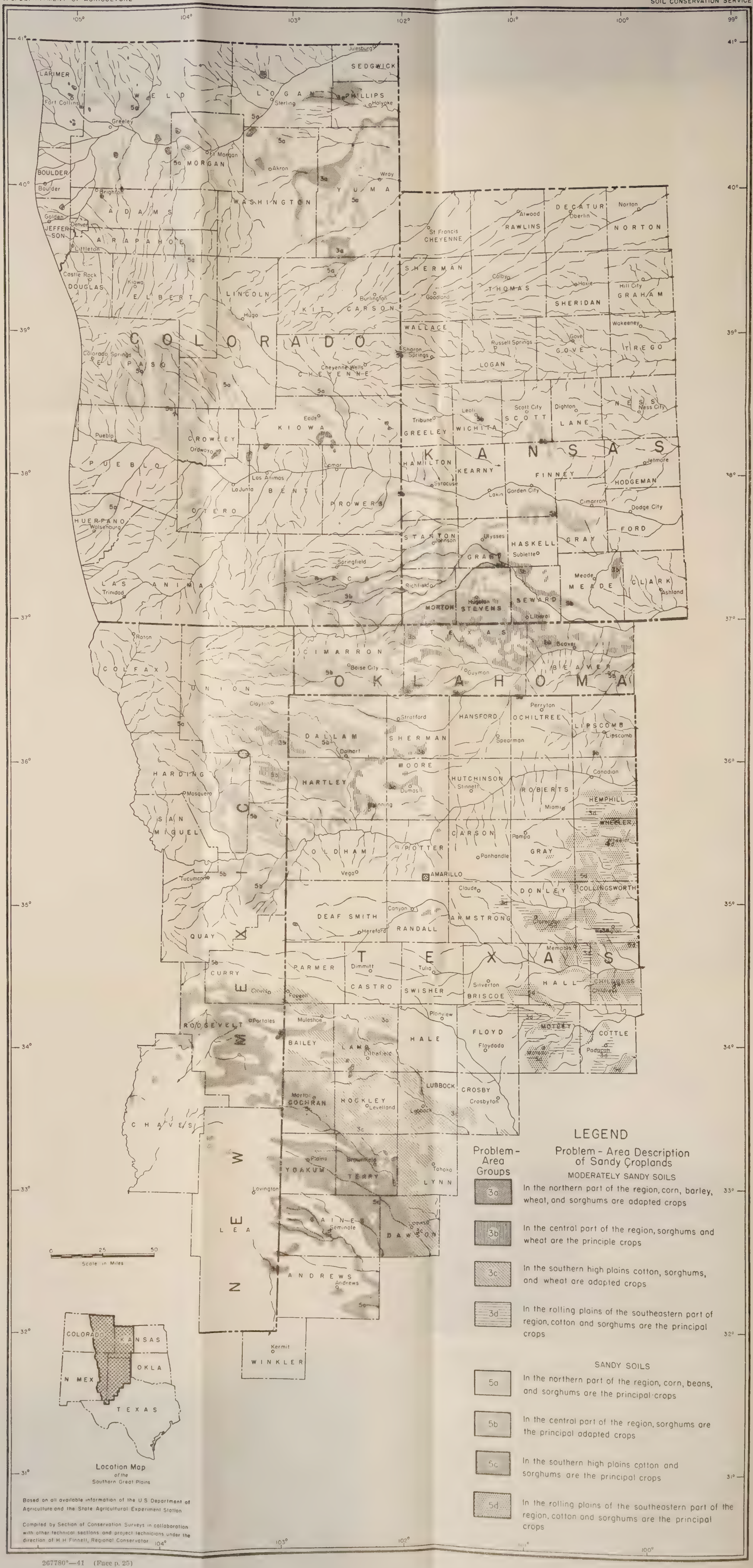

be necessary to acquire additional cultivated land and increase the amount of feed crops and supplementary pastures grown in order to support the livestock enterprise that appears essential for a balanced farming system on the sandy croplands. The factors entering into the problem of reorganizing farm units so that they may be profitable are many and varied and will not be discussed in this publication.

Wildlife and Woodland Program

Tree and shrub windbreaks to protect fields and farmsteads from wind erosion are advisable if wind erosion can be controlled on adjacent fields and if sufficient surface run-off can be diverted to the tree site to raise the annual water supply to the equivalent of 30 inches or more of rainfall. Water diversion to engineered tree sites is often practical on the moderately sandy soils, but on the sandy soils the small amount of run-off and the high absorptive rate may make such methods impractical. Sandy soils, however, absorb most of the rainfall and if this is sufficient and the trees are properly cared for they may make satisfactory growth. Woodland and wildlife plantings should be of drought-resistant species that are adapted to the climate.

Wasteland and odd corners not utilized for crops or pasture should, if the sites are favorable, be planted to trees and shrubs for wildlife and other purposes. Gullies formed by water erosion in many cases may be stabilized and planted to trees and shrubs for wildlife or woodland areas. Retirement of cultivated land to grass, strip cropping, border planting, and the use of shelter strips and windbreaks may be considered good wildlife management practices.

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